



By Shawn Billings, LS

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## Sokkia SRX

A few years ago, when business was booming here in Texas and across the U.S., the demand for our services was growing. My dad and I realized that we needed to expand our survey operation. There were several routes we could pursue—hire more people to help increase production (investing in time and resources for training, salary and benefits), implement new technology, or possibly a combination of both.

At some point every surveyor must decide what responsibilities to delegate to others and to whom. As the old saying goes “A surveyor can’t be at both ends of the chain.” We’ve always preferred to maintain direct control over field and office operations, so for this reason we opted to expand technologically. We chose to use robotics.

The “buy-ins” for robotics and RTK are very close, but because of the nature of our work, our accuracy requirements, and the thick canopy that accompanies the Piney Woods of East Texas, we decided against RTK. While robotic tracking in brush is at times difficult, unlike GPS, accuracy is not diminished by problems such as multipath. Relative vertical accuracy is generally much better with robotics than with GPS (over relatively short distances). GPS requires a cursory understanding of geodesy and differential positioning, while a robotic total station at its core operates the same as a regular total station, so the fundamental measuring involved doesn’t require the user to grapple with as many new concepts as RTK. This was the decision matrix that led us to the robotics, while surveyors in other areas with differing work loads may have come up with a different answer.





The SRX proved to be an ergonomically friendly instrument while operated conventionally. Here the two jog/shuttle motion knobs can be seen as well as the thumb initiated measurement trigger between them.

In the years since, robotics have continued to improve at a rapid pace while the cost of robotic equipment has remained virtually unchanged. Some of the problems encountered with earlier systems such as bulk and, at times, temperamental radio modems, cumbersome external batteries, and excessive weight are largely distant memories. The X Series SRX robotic total station from Sokkia is a great example of the strides made in recent years in surveying robotics.

Fundamentally, a robotic total station comprises three main parts: 1) an auto tracking total station that locks onto a prism by reflection from the prism or an active emitter at the prism and reacts to prism movement, 2) a controller at the pole (generally a data collector), and 3) a wireless modem (for transmitting commands from the controller to the instrument and data from the instrument to the controller). More recently manufacturers have added more bells and whistles to this basic setup. Windows operating systems, reflectorless measuring capability, remote units that quickly redirect the instrument to the prism, and precise guide lights, to name a few, are all found on the SRX.

The SRX is a lightweight robot with great optics. With all of the electronics resident in the scope of a robotic instrument, optics generally don't top the list, but I was impressed with the clarity I observed through the scope. It is fitted with a single touch screen display that

is reasonably discernible in full sun light. Two touch screens would be more convenient for turning sets in a manual traverse, but would add weight, bulk and, no doubt additional cost to the system. Besides the touchscreen the unit also has a full numeric keypad for entering data directly into the instrument.

One of the things I've particularly enjoyed about the newer robots on the market is that there is little setup involved in switching from manual to robotic mode. If for no other reason, this is beneficial for those times you might forget a simple step at the instrument only to realize it after you've headed several hundred feet to the backsight station. With virtually no difference between the two operations there is nothing to remember, and hence, nothing to forget while setting up the instrument.

The new X Series does the things you would expect a robot to do. It tracks very well and is quick, easily maintaining lock on a target at walking speed as close as thirty feet to the instrument. Closer distances necessitate somewhat slower speeds. If lock is lost, the SRX does an excellent job of target recovery thanks to the RC-PR4, Sokkia's dual-purpose answer to communication from the pole to the instrument and to quickly regaining lock on a wayward prism. In testing I found the Sokkia could recover the target, starting 180 degrees off target in about 10 seconds with the RC-PR4. It was



The ATP1 360° prism provides practically no distortion due to parallax and is secured by a quick release attachment. Atop the prism is the combined RC-PR4, the integrated Bluetooth radio transceiver and infrared dog whistle, used to communicate with the SRX or redirect it should it lose lock.

incredibly fast and reliable. Furthermore, in testing at a crowded department store parking lot with reflective traffic cones, numerous tail lights, shiny chrome, and brightly reflective windows, the SRX ignored all distractions using the simple prism search and only locked onto the ATP1 360-degree prism. In such a difficult environment, the SRX met every challenge and did so with aplomb.

The RC-PR4 is an ingenious concept that is functional in the field. It is a bit large and I would prefer to see a more durable build quality for the roving communication hub. I would feel compelled to exercise great care if I were navigating through brush with it. Having said that,





The SRX neatly conceals the Compact Flash (Type II) Slot and USB client (for PC hookup) and USB host (for USB memory).

measure distant objects. It's not a panacea for checking reflectorless measurements in questionable scenarios, but it could mean the difference between successfully collecting the shot or not. Narrow beams also allow for better accuracy on shots with a low angle of incidence.

To test this theory, I took a reflectorless measurement to a visible speck on a concrete curb. The speck was only 30 feet away, but produced a very flat surface for me to test. Then I set up the prism pole on the speck and observed it manually. The two shots simply did not vary by any appreciable amount vertically or horizontally. How about range? The specifications call for a range of 800 meters to a Kodak grey card (90% reflective). In testing I was able to shoot a galvanized signal arm out to 1013 feet, a white stucco building at 1,031 feet, a power line at 655 feet (can you believe it?), a wooden power pole at 1,502 feet, and a steel tower at 1,270 feet. These values do not necessarily represent the farthest these objects could be observed, but give some real world results to real world materials.

Perhaps my only complaint with the system was the data collection software. With the merger of Topcon Positioning and Sokkia Corporation, it was decided to rebadge the TopSURV software from Topcon with the Spectrum Survey Field label. I was really pleased with the

being based on a long-range Bluetooth radio, the communications are very reliable and nearly instant in terms of turning them on and going to work (in geek-speak this would be called plug-and-play functionality). The RC-PR4 actually has two Bluetooth modems inside, one which provides a wireless connection to the data collector, and another which connects to the instrument. The range is stated to be 300 meters. While I did not test this range, this is certainly in line with other long-range Bluetooth devices I have used in the past. The RC-PR4 also uses an infrared fan beam to direct the instrument during a search. The battery in the RC-PR4 is of the small camcorder variety and offers an amazingly long battery life (Bluetooth consumes very little power, making it a great choice for this sort of application).

The ATP1 prism remains a thing of beauty to me. The odd shaped trapezoidal glass offers very low parallax distortion, both vertically and horizontally. This reduces potential error should you forget to verify prism collimation to the instrument. I don't know what the price tag is for an ATP1, however the quick release attachment makes me feel a little more comfortable while affixing it to the prism pole. I'm always a little nervous while trying to thread an expensive piece of equipment to a pole.

When I do a solo survey with the robot, I'll begin with the remote control shots, moving from point to point with the pole and data collector while the robot follows, with the occasional need for a little electronic encouragement to get the gun on target after moving behind

an obstruction or battling with traffic. Once that part of the set up is complete, I will save all of the shots that I can for collecting reflectorlessly while behind the instrument, saving time and foot work. With the instrument operating very similarly between robotics and reflectorless (turn off tracking and switch target types), it is very easy to add reflectorless shots and then continue robotically with very little manipulation of the instrument.

Of course with a more capable reflectorless EDM a surveyor can measure so much more. The Red-tech 800 technology that powers the EDM of the SRX left me a believer. The beam is very narrow—by my rough estimates, perhaps 0.02 foot wide at 100 feet (less than a minute of arc). This is important as you find yourself trying to take advantage of small holes to



TopSURV software when I reviewed Topcon's flagship robot, the IS, and expected to be equally "wowed" with the Sokkia version. However, I was disappointed that the Spectrum Survey Field software was simply not well suited for operating the SRX. While none of the issues were debilitating, they were each inefficient and incongruous with the sophisticated capability of the instrument. During the review, I was using Version 7 and I have been told by representatives from Sokkia that Version 8 addressed most of the issues I was experiencing with 7.

Don't let questionable data collection software keep you from looking at the SRX. The SRX can also be driven by various third-party data collectors as well. The Topcon/Sokkia data collection software offers some incredible features that few if any others offer. I particularly like linking photos taken in the field with points measured in the field.

For more than a decade I have kept a multi-tool of some sort on my belt—pliers with a few screwdrivers, knives, openers, saws, etc. The utility of such a tool is limitless. The new SRX is quite similar, able to accomplish numerous tasks and do them well.

With indulgence from my friend and editor, I would like to deviate briefly from the platform of product reviews and share something extra. Recently, my home state of Texas decided to require all land surveyors registered in the state to have, as part of their continuing education, several hours of ethics study. I recently attended a short seminar on the topic and one of the more stately members of our profession, E. L. "Buster" Sartain of Tyler, Texas, stated that even a mediocre surveyor with good ethics will do well in surveying. I can't help but agree with Mr. Sartain's humble assessment. I enjoy the opportunity to work with new forms of technology, as the opportunity allows, and hopefully these articles have been beneficial to you these past few years as you consider whether to invest in new equipment. But ultimately, good character is the greatest asset a surveyor can ever have.

The Spectrum Survey Field data collection routines will easily calculate any position needed for stakeout or searching for missing corners, but ultimately you, the surveyor, will need to assess whether you have performed enough research or received enough documentation to determine a supremely defensible



With an impressive long range, narrow beamed reflectorless EDM, multiple options for angular accuracy (1, 2, 3 and 5 second models), and a very functional and efficient robotic experience, the SRX is a truly multifunctional instrument that can perform a variety of tasks well with the flexibility to switch hats instantly.

determination of the location of the missing corner. And, while the SRX can easily guide you precisely to the location of a missing stake once calculated, only you, the surveyor, can do the digging needed to insure the stake is not there and then actually set a new monument to replace the old.

Darth Vader once said of the Death Star, "*Don't be too proud of this technological terror you've constructed. The ability to destroy a planet is insignificant next to the potential of the Force.*" I am by no means

suggesting that the SRX is a technological terror, however, a surveyor could have all of the capability of the Death Star, yet without the integrity to do his job properly, the capabilities of any robot are insignificant. My point? Get the best technology you can afford to put in the field, and perform your duties with honor. Honor for your reputation, honor for your company and honor for the profession. *A*

All photos courtesy of Amanda Widener.